

# Wireless In-situ Nondestructive Inspection of Engine Rotor Disks with Ultrasonic Guided Waves, Phase II

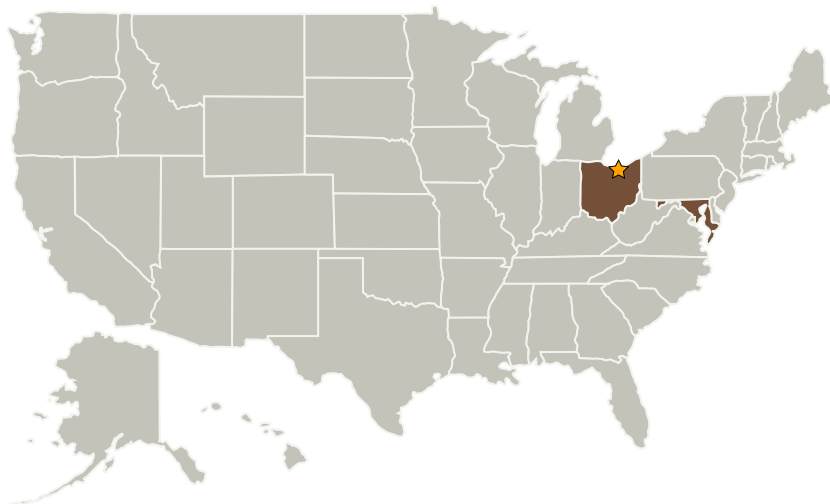
Completed Technology Project (2006 - 2008)



## Project Introduction

The structural integrity of jet engine turbine or fan rotor disks is vital for aviation safety. Cumulative cracks at critical loading and high stress areas, if not detected and repaired in time, may lead to catastrophic failure. Traditional methods such as Fluorescent Penetrant Inspection (FPI) and eddy current are limited to point-by-point measurement and are very time consuming. Disassembly of the engine is required for each inspection, which in turn may cause maintenance induced problems. We propose a wireless in-situ ultrasonic guided wave health monitoring approach. It applies light, thin, high temperature leave-in-place ultrasonic guided wave circumferential patch transducers around the root of the disk, and a pair of innovative tube antennae that wirelessly couple the transducers to the inspection instruments. Guided waves travel in the disk for crack inspection, and the inspection could be done even when the disk is rotating. Phase I results clearly demonstrate that the guided wave is very sensitive to tiny cracks on a rotating aluminum disk, and the tube antennae worked well. The envisioned system can inspect a relatively large area, has minimal effect on the rotor performance, instantaneously provides reliable and quantitative data such as crack location and severity level, and minimize and eventually eliminate the need for structural disassembly.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Glenn Research Center (GRC)

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Intelligent Automation, Inc.	Supporting Organization	Industry	Rockville, Maryland

## Primary U.S. Work Locations

Maryland	Ohio
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX13 Ground, Test, and Surface Systems
  - └ TX13.2 Test and Qualification
    - └ TX13.2.3 Non-Destructive Inspection, Evaluation, and Root Cause Analysis